

another direction is another protocol taking into account asymmetric bandwidth needs in each direction and/or taking into account asymmetric power, cost, weight and/or size limitations.

[0022] In a specific example, a client station sends data to an access point using the 802.11b protocol, while the access point sends data to the client station using the 802.11g protocol. Where most of the data flowing between the client station and the access point is flowing downstream from the access point to the client station, the network capacity is effectively the capacity of the 802.11g protocol with the range of the 802.11b protocol. One reason for this is because 802.11b works at lower SNR's due to the use of DSSS.

[0023] The 802.11g standard is a modification of the previous 802.11b standard that allows for additional, higher data rates. The 802.11b rates are 1, 2, 5.5 and 11 Mbps (four data rates), while the 802.11g rates are 1, 2, 5.5, 6, 9, 11, 12, 18, 22, 24, 33, 36, 48 and 54 Mbps (eleven data rates). For ease of reference, the 1, 2, 5.5 and 11 Mbps data rates are referred to herein as the "11b" rates and the 6, 9, 12, 18, 22, 24, 33, 36, 48 and 54 Mbps data rates are referred to herein as the "OFDM" rates. Note that where the OFDM rates can be used, higher data throughput is possible. However, under some less-than favorable conditions, an 11b rate is preferred over an OFDM rate as, for example, the data can be successfully transmitted using the 11b rates where the signal-to-noise ratios (SNRs) are low, as the required SNRs for 11b rates are lower than for higher rate OFDM rates.

[0024] This asymmetry has significant implications where one of the receivers is more sensitive than the other. For example, if two stations are not near each other, or there are other reasons why significant noise is introduced, a more sensitive receiver can receive at a higher data rate while transmitting to the less sensitive receiver at a lower data rate. The receiver might be more sensitive because it uses innovations such as those described in Steele and U.S. Patent No. \_\_\_\_\_ (U.S. Patent Application 10/068,571, filed on February 5, 2002 on behalf of van Nee et al. and entitled "System for Soft Symbol Decoding with MIMO Log-Map Detection" and hereinafter "van Nee"), which is incorporated by reference herein for all purposes.

[0025] Where two sensitive receivers are used, they can both handle low SNRs. However, where one receiver, such as the receiver in a client device is more sensitive than the receiver in an access point, the access point can transmit using OFDM data rates while the client device transmits using 11b rates. This is advantageous especially where the data flow is greater towards the client device than away from the client device - a typical scenario where

access point station hardware 22, a transmit section of access point station hardware 22, a receive section of client station hardware 20 and the device I/O section of client station hardware 20. The characteristics of wireless channel 21 depend on many factors, such as the location of client station hardware 20 and access point station hardware 22 as well as

5 intervening objects, such as walls, buildings and natural obstructions, as well as influences by other devices and transmitters and receivers and signal-reflecting surfaces.

[0019] Typically, client station hardware 20 can be integrated in with client device 14. For example, where client device 14 is a laptop computer, client station hardware 20 might be an add-on PCMCIA card that is inserted into the laptop's PCMCIA slot. Access point station

10 hardware 22 might be implemented as part of a wired network interface device that is just used to couple a wired network to a wireless network. Notwithstanding the typical implementation, it should be understood that nothing here prevents the diagram of Fig. 2 from being entirely symmetrical, i.e., wherein client station hardware 20 and access point station hardware 22 are nearly identical instances of hardware devices, however in many 15 cases, a station that is an access point will be fixed and the station that is not an access point is in a portable or mobile device where power usage, cost, weight and/or size are considerations. Furthermore, communication is not limited to being between a client and an access point, as two clients can communicate and two access points can communicate.

[0020] What follows is a detailed description of a receive section. Fig. 3 illustrates 20 components of a receive section 30. Receive section 30 receives one or more signals over the wireless channel via antennas 32, which are initially processed by RF section 34. RF section 34 might, for example, process the signals to form baseband signals to form digital signal streams. As shown, receive section 30 also might include FIR(s) 35 and various subsections 40, 42, 44 for processing 802.11a, 802.11b and 802.11 extended signals, respectively.

25 Further details of elements of receive section 30 not more fully described herein are shown in U.S. Patent No. \_\_\_\_\_ (U.S. Patent Application 10/068,360, filed on February 5, 2002 on behalf of Steele et al. and entitled "Multi-Antenna Wireless Receiver Chain With Vector Decoding" and hereinafter "<sup>now abandoned</sup> Steele"), which is incorporated by reference herein for all purposes. It should be understood that the present invention is not limited to the particular 30 receiver implementations shown here or there.

[0021] In the asymmetric modes described herein, transmission from a client station (e.g., a mobile and/or portable station) to an access point, in one direction is one protocol and in